# LINEAR INTEGRATED CIRCUIT

# TDA 2161

## SYNCHRONOUS DEMODULATOR AND RGB MATRIX FOR COLOUR TV WITH ON SCREEN DISPLAY FACILITY

The TDA 2161 is a monolithic integrated circuit for demodulating and matrixing chroma signals. It is used for RGB cathode driving of colour pictures tubes and is directly coupled to the video output stages. The TDA 2161 is encapsulated in a 16-lead dual in-line plastic package and its main features are:

- High stability of DC output voltages ensured by applying heavy feedback from the output stages
- Large bandwidth
- Tight thermal coupling between the three channels
- Low subcarrier leakage due to integrated active filters
- Large black level adjustment range
- Large dynamic swing of the output signals
- High electrical stability of RGB amplifiers assured by internal frequency compensations
- Box blanking for characters display on screen.

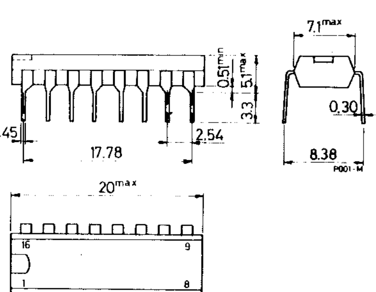
## ABSOLUTE MAXIMUM RATINGS

| | | | |
|---|---|---|---|
| $V_s$ | Supply voltage (pin 9) | 15 | V |
| $V_{12}$ | Voltage at pin 12 | $V_s$ | |
| $P_{tot}$ | Total power dissipation at $T_{amb} \leqslant 70°C$ | 800 | mW |
| $T_{stg}$ | Storage temperature | -55 to 150 | °C |
| $T_{op}$ | Operating temperature | 0 to 70 | °C |

**ORDERING NUMBER:** TDA 2161

## MECHANICAL DATA

Dimensions in mm



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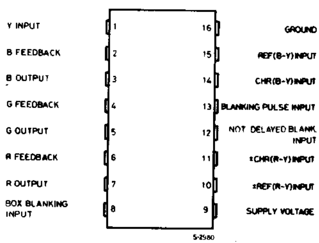
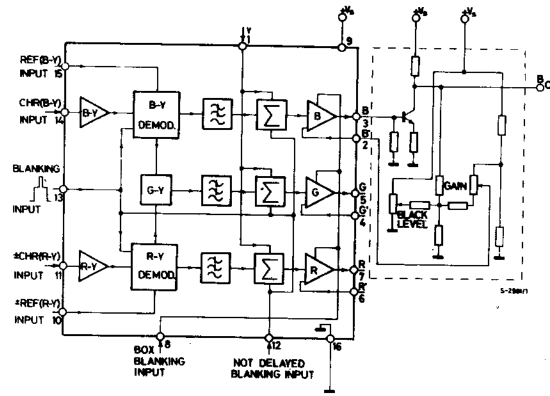
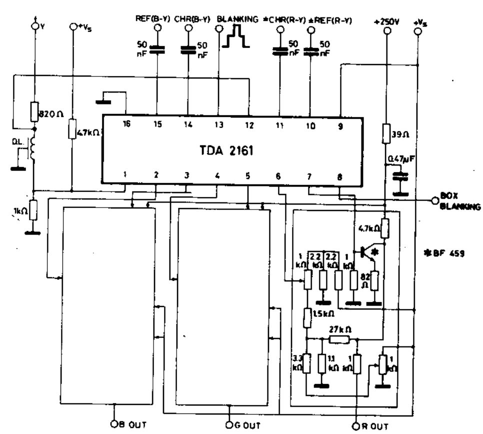
## CONNECTION AND BLOCK DIAGRAMS
(top view)



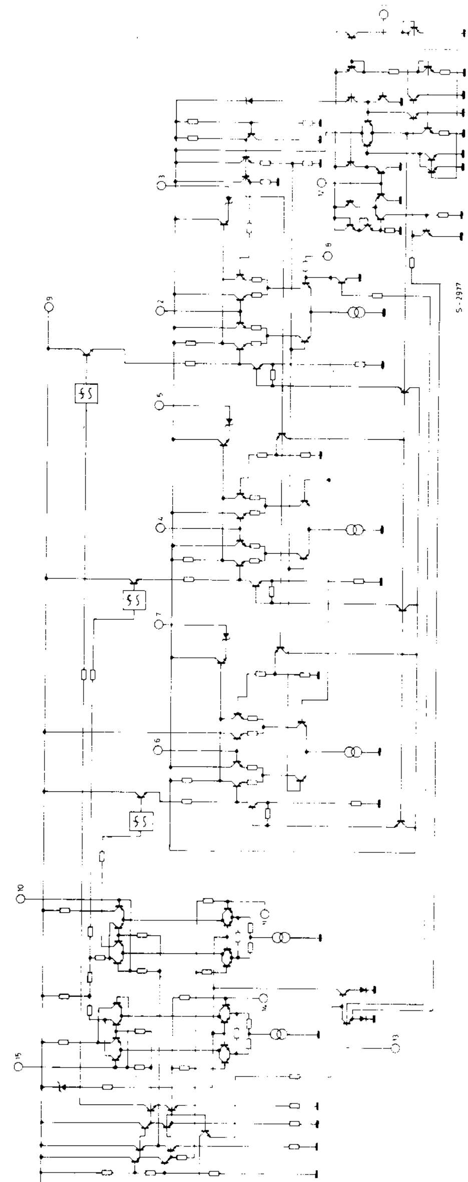

## TEST CIRCUIT




## THERMAL DATA

| | | | | |
|---|---|---|---|---|
| $R_{th\ j\text{-}amb}$ | Thermal resistance junction-ambient | max | 100 | °C/W |

## SCHEMATIC DIAGRAM



## ELECTRICAL CHARACTERISTICS

(Refer to the test circuit, $V_s = 12V$, $T_{amb} = 25°C$ unless otherwise specified)

| | Parameter | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_S$ | Supply voltage (pin 9) | | 10.8 | | 13.2 | V |
| $I_S$ | Supply current (pin 9) | | | 35 | 46 | mA |
| $V_1$ | Peak to peak luminance input signal | CRT cathodes signal = 100 Vpp | | 1 | | V |
| $V_1$ | Black level voltage of luminance input signal | | | 2.2 | | V |
| $R_1$ | Luminance input resistance | | | 50 | | kΩ |
| $G_V$ | Gain of luminance channels (including video output stages) | f = 0.5 MHz $V_i$ = 1 Vpp | | 100 | | – |
| $B_Y$ | Frequency response of luminance channels (-3 dB) | $V_i$ = 200 mVpp | | 6 | | MHz |
| $V_8$ | Box blanking input pulse | | 2.5 | | 5 | V |
| $V_{11}$ | Chr. (R-Y) peak to peak input signal for max. output | f = 4.4 MHz Output signals linearity factor: m = 0.7 | | 470 | | mV |
| $V_{14}$ | Chr. (B-Y) peak to peak input signal for max. output | f = 4.4 MHz Output signals linearity factor: m = 0.7 | | 350 | | mV |
| $R_{11}$ | Chr. (R-Y) input resistance | f = 4.4 MHz | | 1 | | kΩ |
| $C_{11}$ | Chr. (R-Y) input capacitance | f = 4.4 MHz | | | 5 | pF |
| $R_{14}$ | Chr. (B-Y) input resistance | f = 4.4 MHz | | 1 | | kΩ |
| $C_{14}$ | Chr. (B-Y) input capacitance | f = 4.4 MHz | | | 5 | pF |
| $V_{10}$ | ± Ref. (R-Y) peak to peak input signal | f = 4.4 MHz | | 0.8 | | V |
| $R_{10}$ | ± Ref. (R-Y) input resistance | f = 4.4 MHz | | 2 | | kΩ |
| $V_{15}$ | Ref. (B-Y) input signal | f = 4.4 MHz | | 0.8 | | V |
| $R_{15}$ | Ref. (B-Y) input resistance | f = 4.4 MHz | | 2 | | kΩ |
| $G_{R-Y}$ | Gain of (R-Y) demodulator (note) | f = 4.4 MHz $V_i$ = 50mVpp | | 3.3 | | – |

## ELECTRICAL CHARACTERISTICS (continued)

| Parameter | | Test conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $\frac{G_{B-Y}}{G_{R-Y}}$ | (B-Y) demodulator gain to (R-Y) demodulator gain ratio | f = 4.4 MHz $V_i$ = 50mVpp $V_{14}$ = 50mVpp $V_{10} = V_{15}$ = 700 mVpp | | 1.78 | | – |
| $\frac{V_{G-Y}}{V_{R-Y}}$ | (G-Y) to (R-Y) matrix ratio | f = 4.4 MHz $V_{11}$ - 50mVpp $V_{10}$ = 700 m Vpp | | -0.51 | | – |
| $\frac{V_{G-Y}}{V_{B-Y}}$ | (G-Y) to (B-Y) matrix ratio | f = 4.4 MHz $V_{14}$ = 50mVpp $V_{15}$ = 700 mVpp | | -0.19 | | – |
| $B_{Chr}$ | Frequency response of colour difference channels (-3 dB) | $V_{11}$ = 0.1 Vpp $V_{14}$ = 0.1 Vpp $V_{10} = V_{15}$ = 700 mVpp | 1 | 1.2 | | MHz |
| $V_3$ | B output voltage swing | m ⩾ 0.7 | | 3 | | V |
| $V_5$ | G output voltage swing | m ⩾ 0.7 | | 3 | | V |
| $V_7$ | R output voltage swing | m ⩾ 0.7 | | 3 | | V |
| $V_{13}$ | Blanking input voltage | | 1 | | | V |
| $I_{13}$ | Blanking input current | | 10 | | | μA |
| $\Delta V_o$ | DC differential voltage between RGB outputs (at c.r.t. cathodes) | $V_1 = V_{12}$ | | | 5 | V |
| | Residual carrier at the CRT cathodes | | | | 2 | Vpp |

## APPLICATION INFORMATION

**Pin 1 – Luminance input**
The luminance signal enters at pin 1 with a typical black to white amplitude of 1V and a black level of 2.2V. The typical input impedance is 50 kΩ/5 pF.

**Pin 2 – Blue channel feedback**
The DC working points and gains of the output stages and the IC amplifier stages are stabilized by the feedback circuits. The gain and black level of the RGB output stages are adjusted to have the black and white setting points on the picture tube, by means of the potentiometers in the feedback paths.

## APPLICATION INFORMATION (continued)

**Pin 3 - Blue signal output**
The low output impedance and the dynamic swing of the B signal output allows direct driving of th video output stage.

**Pin 4 - Green channel feedback (see pin 2)**

**Pin 5 - Green signal output (see pin 3)**

**Pin 6 - Red channel feedback (see pin 2)**

**Pin 7 - Red signal output (see pin 3)**

**Pin 8 - Box blanking input**
Positive going pulses are required. The high impedance input is TTL compatible.

**Pin 9 - Positive supply**
The operating supply voltage of the device ranges from 10.8 to 13.2V.

**Pin 10 - ± (R-Y) reference input**
A DC blocking capacitor is required to avoid DC unbalance of the demodulator. A minimum peak t peak signal of 0.5V is required to ensure good demodulator performance.

**Pin 11 - ± (R-Y) chroma signal input**
The (B-Y) and (R-Y) demodulators have different amplification gain to compensate for the differen attenuation of the chrominance signal components. This results in a gain of 3.3 for the (R-Y) detecto while the relationship between the gain of the (B-Y) detector and that of the (R-Y) detector is 1.78 The gain is calculated on the peak-to-peak values at the input and output of the demodulator, usin standard colour bars as a test signal. To obtain maximum output, the chrominance input signals mus have a typical value of 350 mVpp for (B-Y) and 370 mVpp for (R-Y). In addition to the chrominanc signal components, the burst also arrives at the demodulators. If demodulated, the burst would alte the blanking level on the video output stages. The demodulators must therefore be shut off durin flyback and this is done by the sandcastle pulse applied at pin 13 of the IC. The (G-Y) component i obtained from the outputs of the two demodulators by means of the passive matrix according to th equation: (G-Y) = -0.51 (R-Y) -0.19 (B-Y).

**Pin 12 - Not delayed blanking input**
The not delayed blanking pulse, available before the luminance delay line, is combined internally wit the blanking pulse applied at pin 13.

**Pin 13 - Blanking input**
The demodulators are blanked by applying at pin 13 a positive pulse which must exceed the interna threshold of 1.5V. The input impedance is 5 kΩ.

**Pin 14 - (B-Y) chroma signal input (see pin 11)**

**Pin 15 - (B-Y) reference input (see pin 10)**

**Pin 16 - Ground**

# APPLICATION CIRCUIT